Fisheries and Oceans Canada | Pêches et Océans Canada
Ecosystems and Oceans Science | Sciences des écosystèmes et des océans

Maritimes Region

Canadian Science Advisory Secretariat
Science Response 2016/042

2016 MARITIMES WINTER RESEARCH VESSEL SURVEY TRENDS ON GEORGES BANK

Context

DFO has conducted winter Research Vessel (RV) surveys in the Maritimes Region, Northwest Atlantic Fisheries Organization (NAFO) Division 5Z (Georges Bank) using a standardized protocol since 1987. Results from these surveys provide information on trends in abundance for groundfish species in the Maritimes Region. While these data reflect trends in biomass and abundance and are a critical part of science-based stock assessments, a full assessment, including other sources of data, would be required to evaluate the impacts of management measures on population status. The 2016 Winter RV Survey was conducted using the *CCGS Teleost*, rather than the *CCGS Alfred Needler*, the vessel that typically conducts the survey. Survey indices from these two vessels are not expected to differ. Fisheries and Aquaculture Management (FAM) requested a review of the DFO Winter RV Survey information on the following species in Strata 5Z1-5Z4 (Figure 1): Cod, Haddock, Pollock, Yellowtail Flounder, Smooth Skate, Thorny Skate, Barndoor Skate, Winter Skate, and Little Skate. The survey information will be used by FAM as background for discussions with various industry stakeholders on recommendations for management measures, and to determine which stocks should be reviewed in more detail in 2017.

This Science Response Report results from the Science Response Process of June 2, 2016, on the Stock Abundance Trends from the Maritimes Research Vessel Survey of Georges Bank.

Background

The Georges Bank (5Z) Winter RV Survey has been conducted annually since 1987. The survey follows a stratified random sampling design, and includes sampling of fish and invertebrates using a bottom otter trawl. These surveys are the primary data source for monitoring trends in species distribution, abundance, and biological condition on Georges Bank (for details see Stone and Gross, 2012).

This survey was initially designed to provide abundance trends for fish and invertebrates between depths of about 30m and 200m; the depth range found in Strata 5Z1–5Z8 (Figure 1). Stratum 5Z9 covers the deeper water of the Fundian Channel and has only been sampled since 2007. Sampling is generally conducted between mid-February and mid-March with 103 stations allocated within Strata 5Z1–5Z9. Coverage of Strata 5Z5–5Z8 has been spotty in recent years, due to problems with vessel breakdown and poor weather; however, the survey has covered Strata 5Z1–5Z4 in all years. Survey indices are expected to be proportional to abundance for species that are found primarily in the shallower water on top of Georges Bank, but may not be useful for species that primarily inhabit depths greater than 200m in winter.

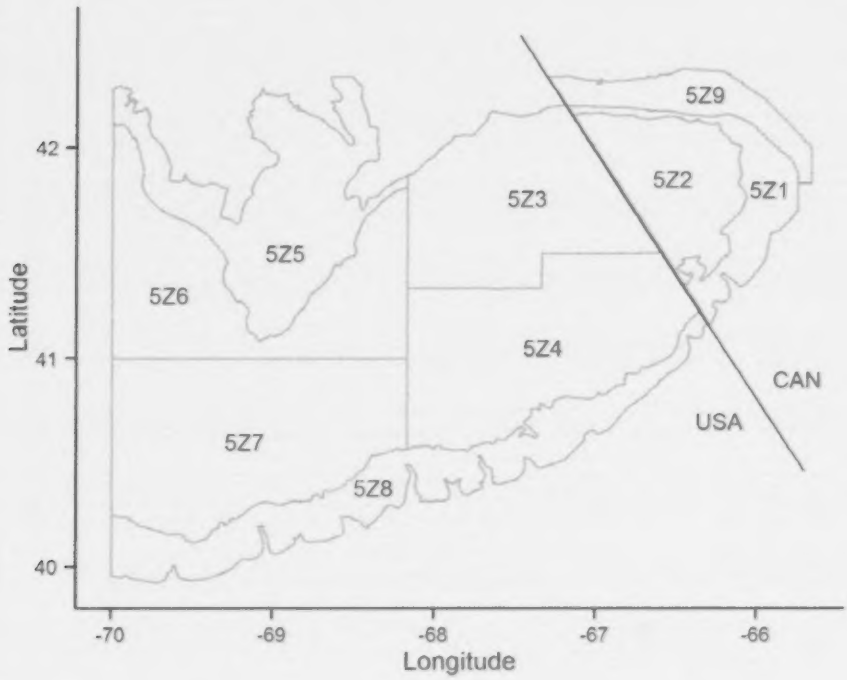

Figure 1. Georges Bank (5Z) Winter RV Survey strata

Analysis and Response

The 2016 winter RV Survey successfully completed 87 tows in Division 5Z between February 24–March 9, 2016. Sampling was conducted in all strata, with 61 successful sets in Strata 5Z1-5Z4. Catch distribution plots for the area sampled are provided for the suite of species requested. Biomass index trends are shown for Strata 5Z1–5Z4. Comparisons of 2015 and 2016 length frequencies (total abundance at length) from the survey catch in Strata 5Z1-5Z4 to the long-term mean (1987-2014) are also included for the selected stocks.

The time-series of survey biomass indices are compared to averages for a series of time periods to provide historical context for biomass levels. The time periods used are a short-term 5-year average (2011-2015) and the long-term survey average (1987–2015). The values are presented in Table 1. Information on the calculation of these indices is contained in Stone and Gross (2012). For some species, such as Pollock, the median is much lower than the mean; the very high values for some years have a large influence on the mean such that there are only 7 years in the 29-year series where the catch of Pollock is above average.

Winter Skate and Little Skate cannot be reliably distinguished at lengths less than about 40cm. Given that the majority of the Winter and Little skates captured in the surveys are generally in this length range, the biomass trends are influenced by the contribution of fish for which identification is uncertain (for more information see McEachran and Musick, 1973).

Table 1. Research Vessel Survey biomass indices (tonnes) by species for 2014, 2015, 2016, as well as short (2011-2015) and long-term means (1987-2015), and long-term median (1987-2015) time periods. No averages were provided for mixed Little and Winter skates because sampling began in 2014.

Species	2014	2015	2016	1987-2015 Mean	2011-2015 Mean	1987-2015 Median
Cod	2373	3652	3625	17,071	5560	13,426
Haddock	82,998	261,530	232,880	65,511	127,162	56,545
Pollock	166	1591	168	5546	3735	1739
Yellowtail	513	822	1728	11,505	2303	5303
Smooth Skate	0	5	0.3	10	9	7
Thorny Skate	0	45	63	165	52	113
Barndoor Skate	35	83	281	159	221	112
Winter Skate	8649	5428	26,531	13,485	8948	9996
Little Skate	16,600	3407	4327	7305	7034	6622
Mixed Winter/Little Skate	3180	126	550	-	-	-

Atlantic Cod

Atlantic Cod were distributed primarily on the northeast portion of Georges Bank in Strata 5Z1 and 5Z2 (Figure 2a). The biomass of Atlantic Cod remains below the long term average (Figure 2b) and the length frequency index observed in 2016 was below the long-term mean at all lengths (Figure 2c).

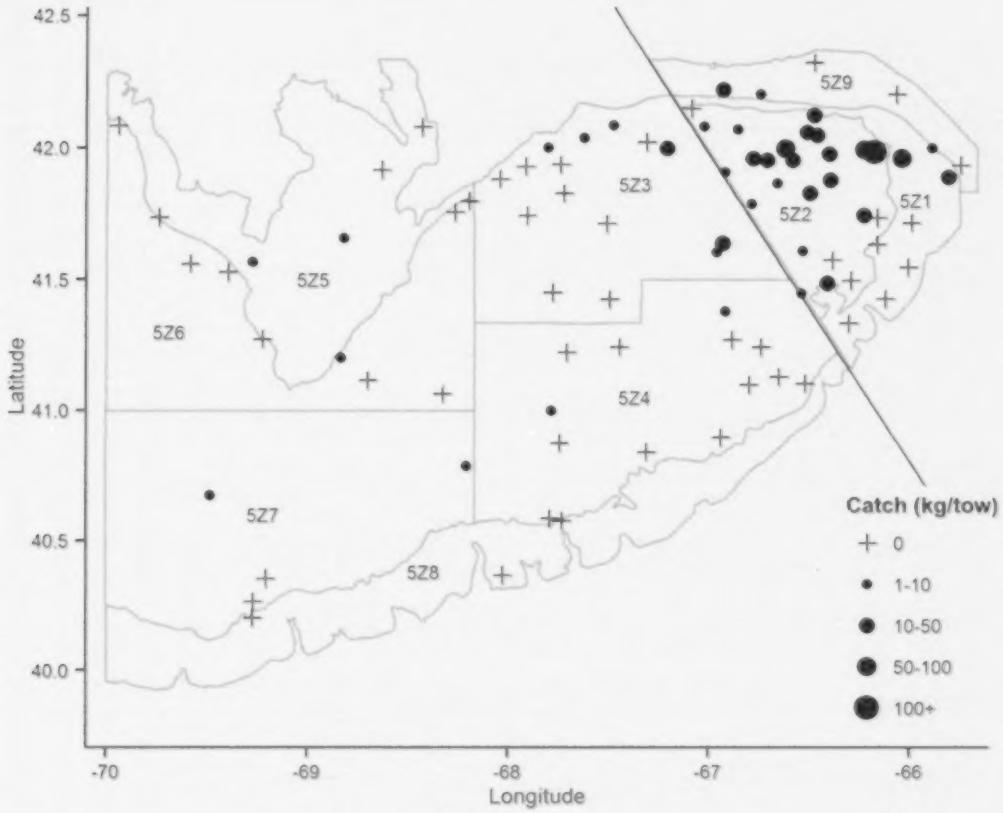

Figure 2a. Distribution of Atlantic Cod catches during the 2016 Winter RV Survey. Zero catch is represented by the + symbol. Black circles represent catches. The circle area is proportional to the catch size.

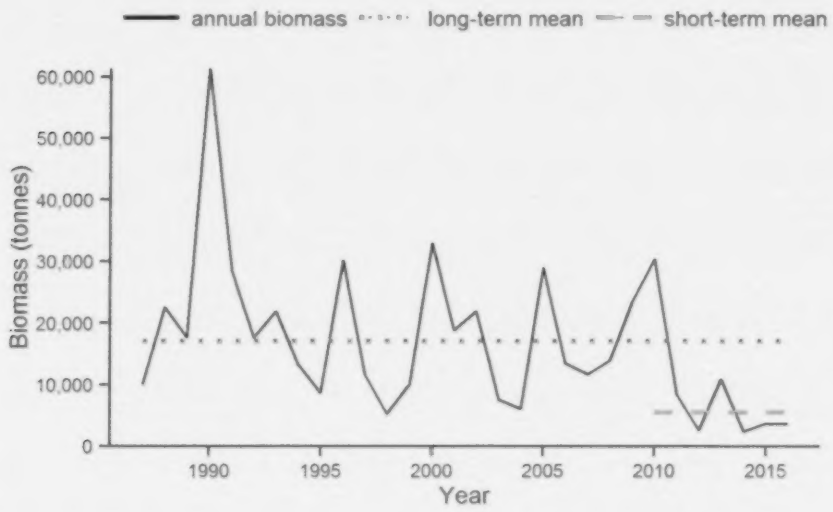

Figure 2b. Biomass index for Atlantic Cod in Strata 5Z1-5Z4 from the winter RV Survey is represented by the solid black line. The dotted red line represents the long-term survey average (1987-2015). The dashed blue line represents the short-term 5-year average (2011-2015).

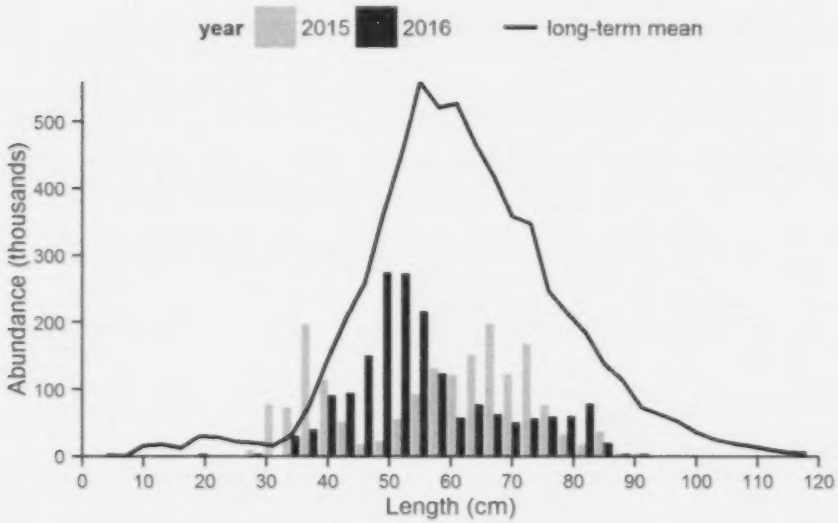

Figure 2c. Length frequency indices for Atlantic Cod in Strata 5Z1-5Z4 from the Winter RV Survey. The grey bars represent the estimated number in thousands at length for 2015. The black bars represent the estimated number in thousands at length for 2016. The solid black line represents the average number in thousands at length for the time period 1987-2014.

Haddock

Haddock were found throughout much of the sampling area and were particularly abundant in Stratum 5Z2, where the catch exceeded 1,000kg in more than half the tows from that strata (Figure 3a). The biomass of Haddock remains above the historical average (Figure 3b). Abundance is high between 26 and 40 cm. This is higher than the mode in 2015 and tracks the growth of the very abundant 2013 year-class (Figure 3c). Abundance is close to average for larger Haddock and below average for smaller Haddock, suggesting the 2014 and 2015 year-classes may be below average.

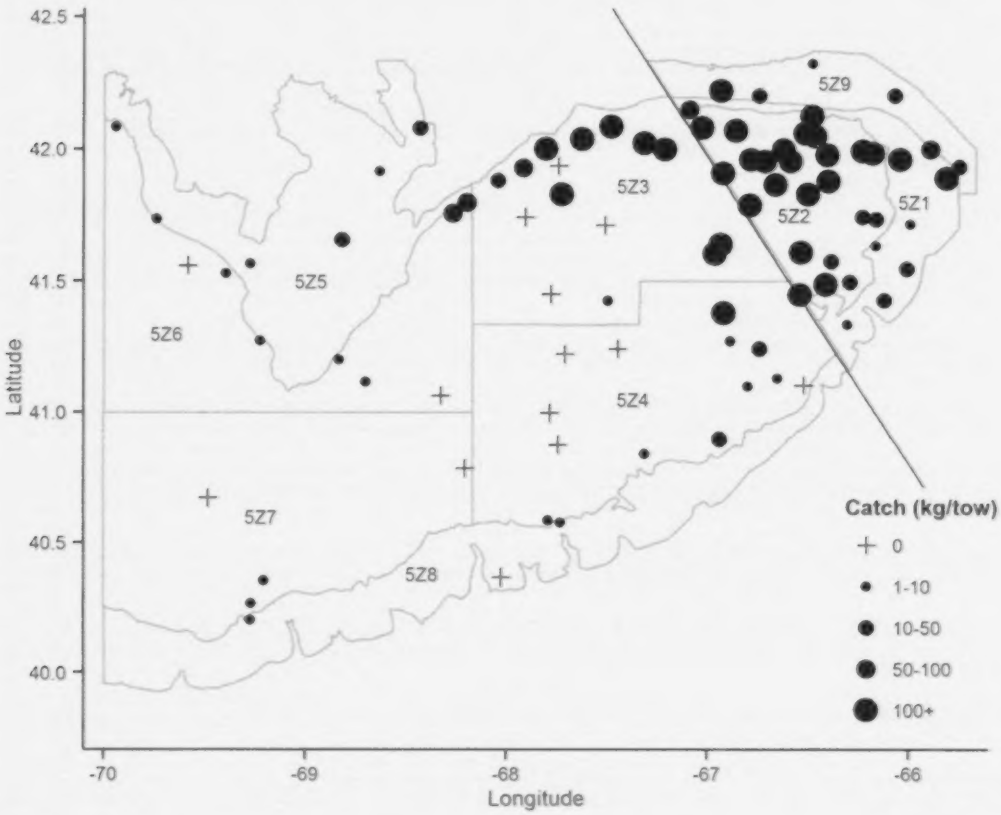

Figure 3a. Distribution of Haddock catches during the 2016 winter RV Survey. Zero catch is represented by the + symbol. Black circles represent catches. The circle area is proportional to the catch size.

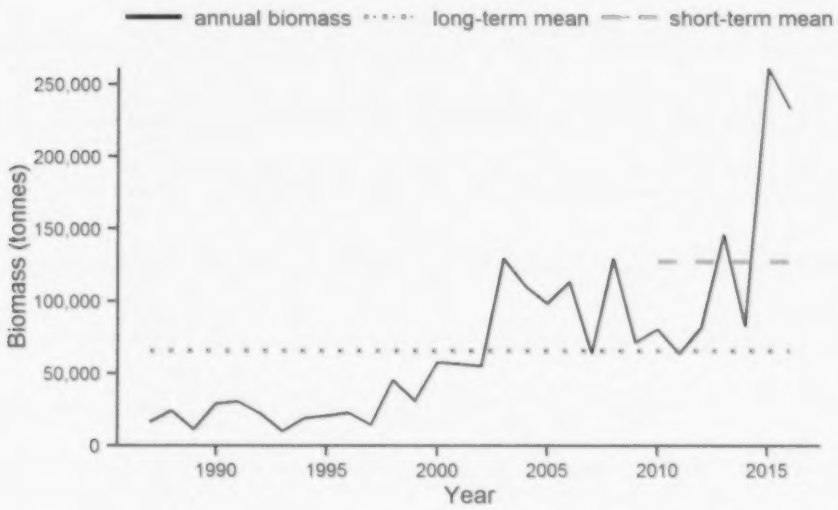

Figure 3b. Biomass index for Haddock in Strata 5Z1-5Z4 from the Winter RV Survey is represented by the solid black line. The dotted red line represents the long-term survey average (1987-2015). The dashed blue line represents the short-term 5-year average (2011-2015).

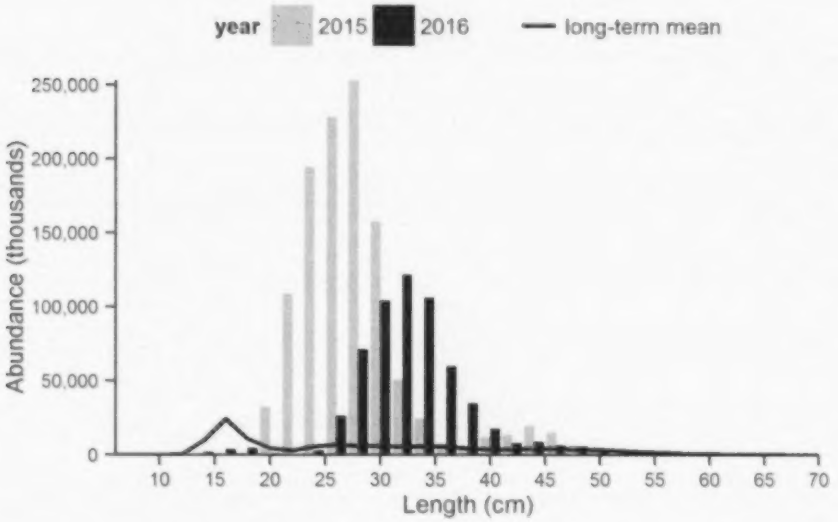

Figure 3c. Length frequency indices for Haddock in Strata 5Z1-5Z4 from the Winter RV Survey. The grey bars represent the estimated number in thousands at length for 2015. The black bars represent the estimated number in thousands at length for 2016. The solid black line represents the average number in thousands at length for the time period 1987-2014.

Pollock

Pollock were caught primarily in Stratum 5Z9, outside the area used for developing indices (Figure 4a). The biomass index (Figure 4b) and abundance indices at-length were both very low for Pollock in 2016 (Figure 4c); however, large fluctuations in the biomass is common throughout the time series.

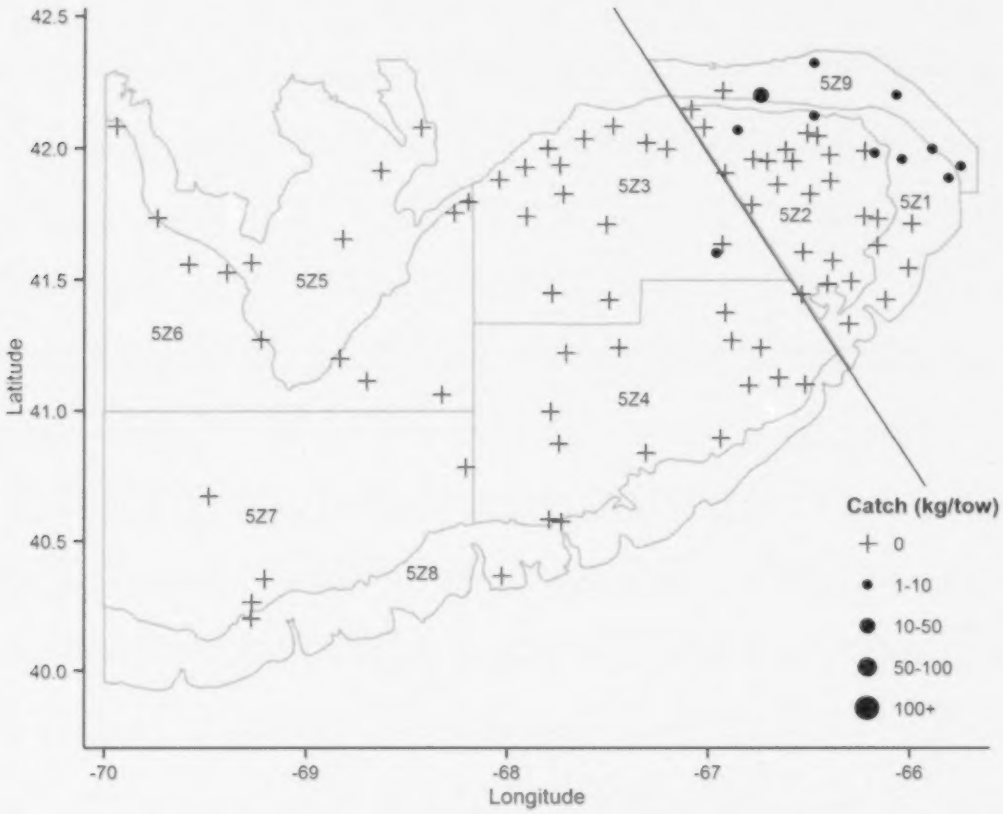

Figure 4a. Distribution of Pollock catches during the 2016 Winter RV Survey. Zero catch is represented by the + symbol. Black circles represent catches. The circle area is proportional to the catch size.

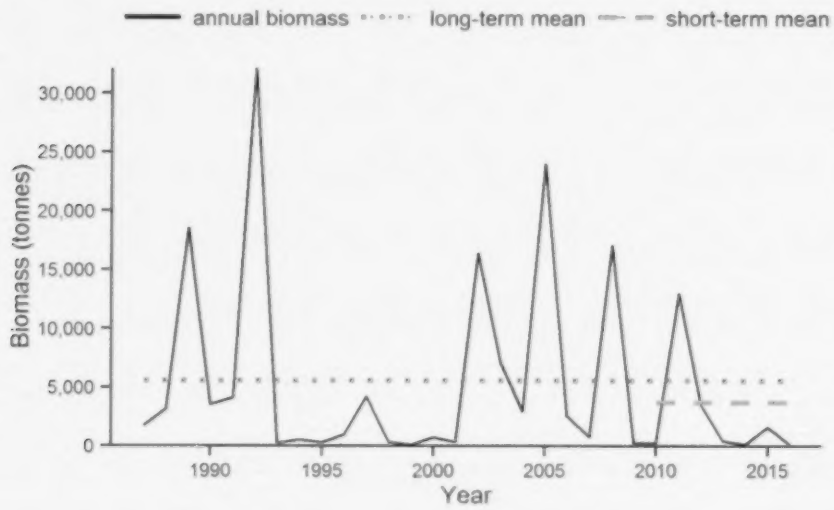

Figure 4b. Biomass index for Pollock in Strata 5Z1-5Z4 from the Winter RV Survey is represented by the solid black line. The dotted red line represents the long-term survey average (1987-2015). The dashed blue line represents the short-term 5-year average (2011-2015).

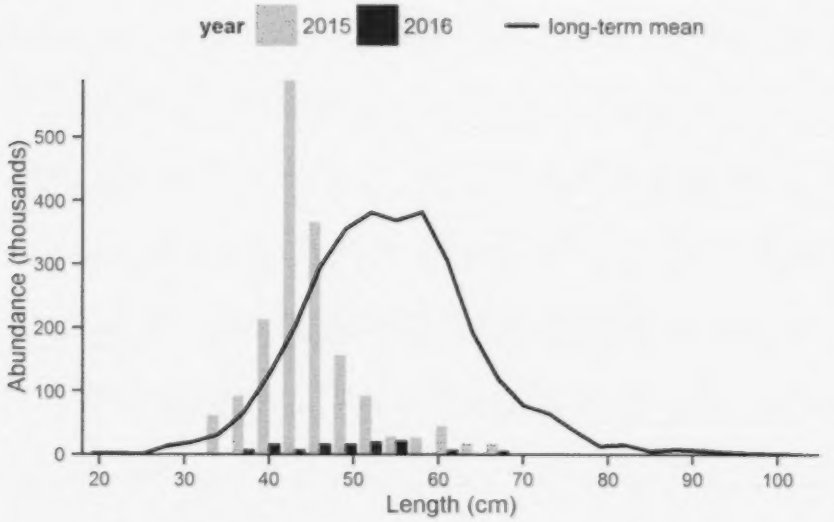

Figure 4c. Length frequency indices for Pollock in Strata 5Z1-5Z4 from the Winter RV Survey. The grey bars represent the estimated number in thousands at length for 2015. The black bars represent the estimated number in thousands at length for 2016. The solid black line represents the average number in thousands at length for the time period 1987-2014.

Yellowtail Flounder

Yellowtail Flounder were found primarily in Strata 5Z2 and 5Z4 (Figure 5a). The biomass remains below the long-term mean (Figure 5b) and the indices at all length groups also remains below the long-term mean (Figure 5c).

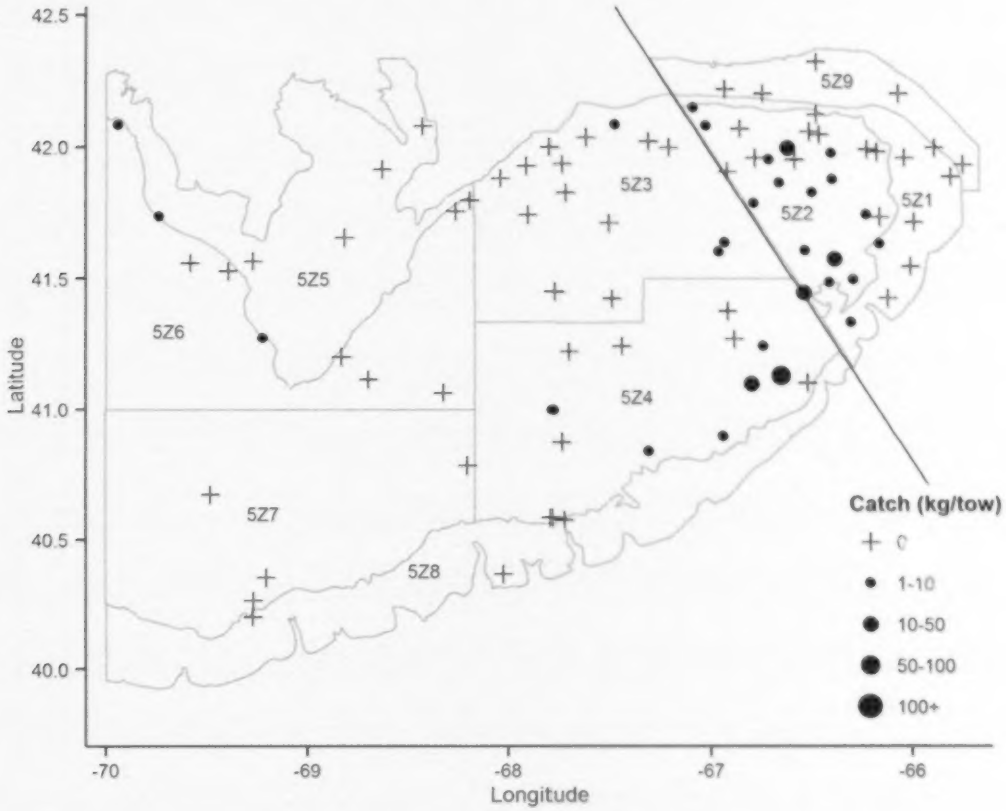

Figure 5a. Distribution of Yellowtail Flounder catches during the 2016 Winter RV Survey. Zero catch is represented by the + symbol. Black circles represent catches. The circle area is proportional to the catch size.

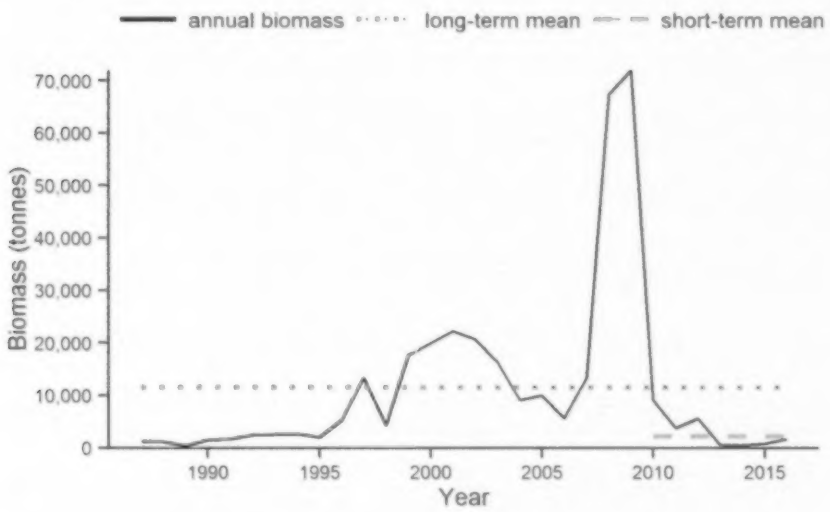

Figure 5b. Biomass index for Yellowtail Flounder in Strata 5Z1-5Z4 from the Winter RV Survey is represented by the solid black line. The dotted red line represents the long-term survey average (1987-2015). The dashed blue line represents the short-term 5-year average (2011-2015).

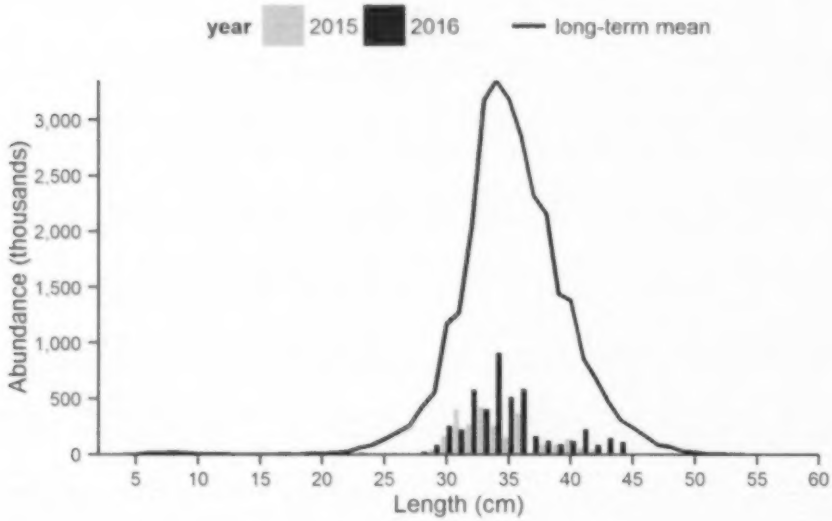

Figure 5c. Length frequency indices for Yellowtail Flounder in Strata 5Z1-5Z4 from the Winter RV Survey. The grey bars represent the estimated number in thousands at length for 2015. The black bars represent the estimated number in thousands at length for 2016. The solid black line represents the average number in thousands at length for the time period 1987-2014.

Smooth Skate

Smooth Skate were caught in small numbers in only 5 sets, only 1 of which fell within Strata 5Z1-5Z4 index area (Figure 6a). The biomass estimate is very low in all years (Figure 6b). Only one length group was observed in 2016 (Figure 6c). The long-term median is 0 for all lengths, which indicates that the survey infrequently captures Smooth Skate at any length within Strata 5Z1–5Z4.

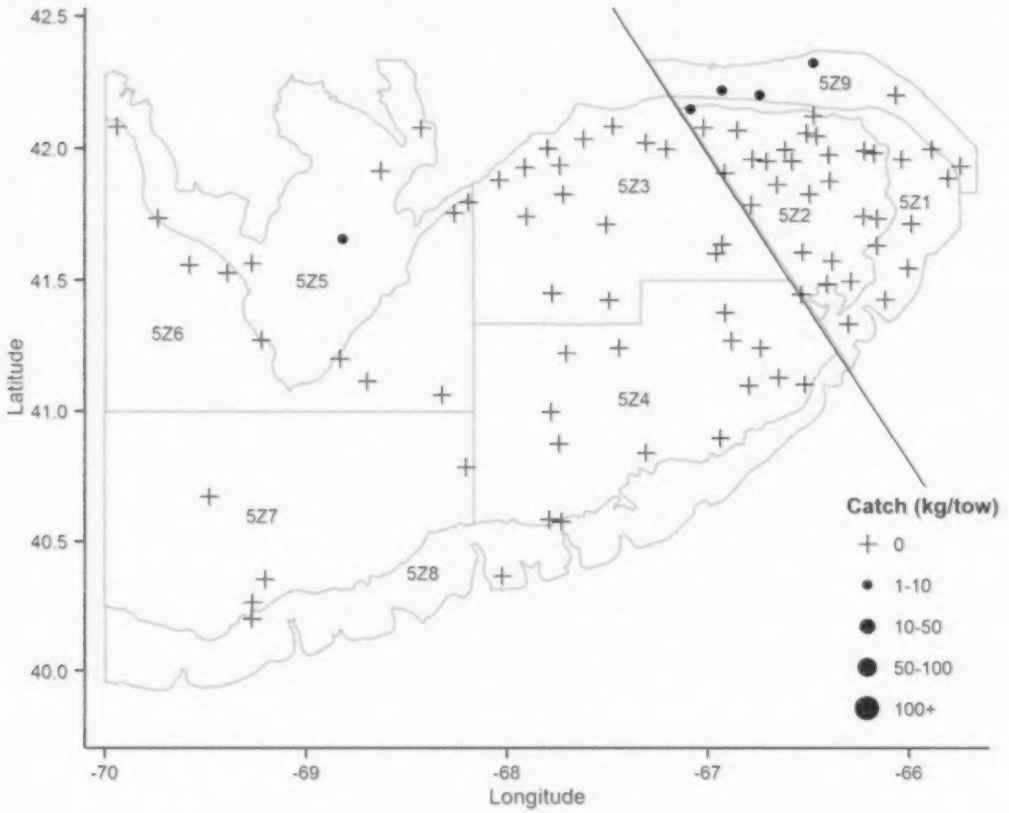

Figure 6a. Distribution of Smooth Skate catches during the 2016 Winter RV Survey. Zero catch is represented by the + symbol. Black circles represent catches. The circle area is proportional to the catch size.

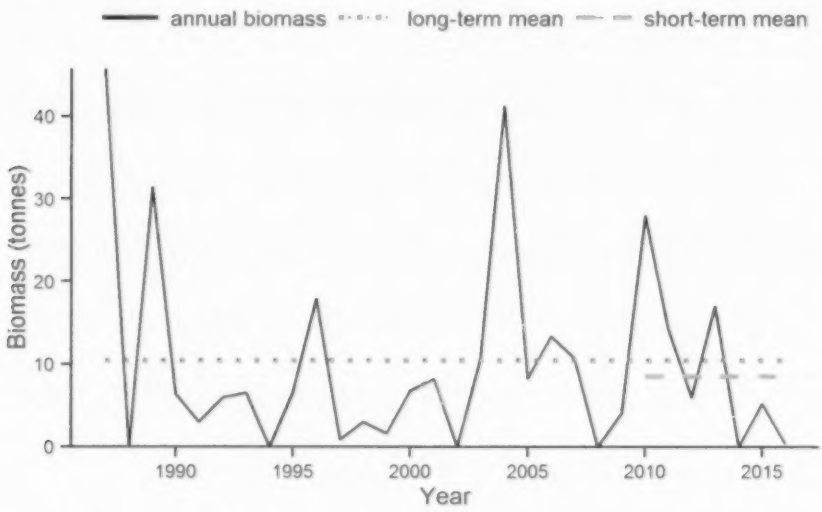

Figure 6b. Biomass index for Smooth Skate in Strata 5Z1-5Z4 from the Winter RV Survey is represented by the solid black line. The dotted red line represents the long-term survey average (1987-2015). The dashed blue line represents the short-term 5-year average (2011-2015).

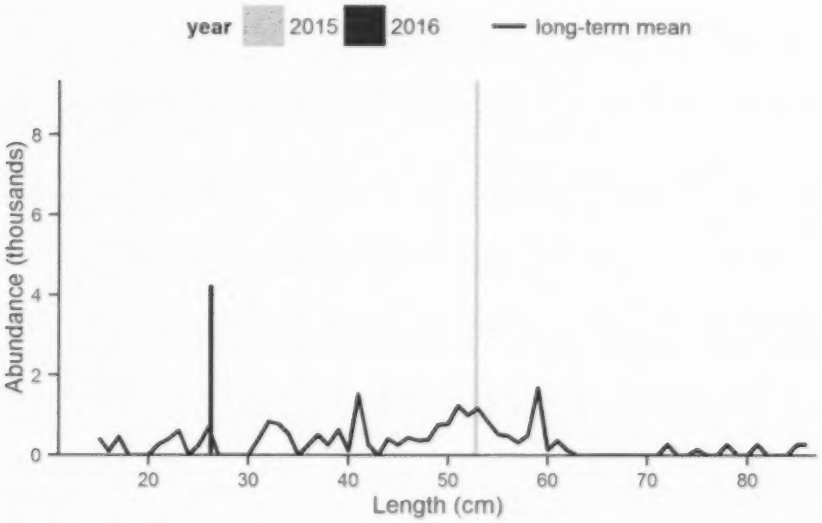

Figure 6c. Length frequency indices for Smooth Skate in Strata 5Z1-5Z4 from the Winter RV Survey. The grey bars represent the estimated number in thousands at length for 2015. The black bars represent the estimated number in thousands at length for 2016. The solid black line represents the average number in thousands at length for the time period 1987-2014.

Thorny Skate

Thorny Skate were caught in small numbers in 5 sets on the northeast edge of Georges Bank, 3 of which were in Strata 5Z1–5Z4 (Figure 7a). The current biomass estimate is below the long-term mean (Figure 7b) and only large fish (three in total) were captured in the 2016 survey (Figure 7c).

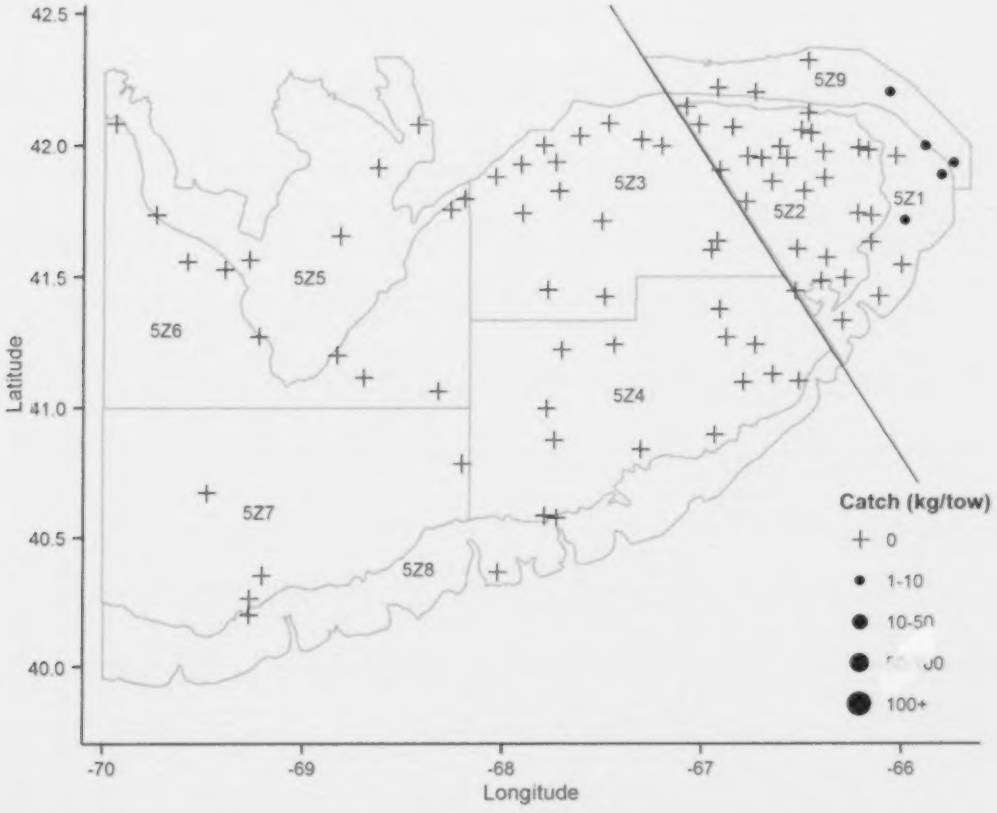

Figure 7a. Distribution of Thorny Skate catches during the 2016 Winter RV Survey. Zero catch is represented by the + symbol. Black circles represent catches. The circle area is proportional to the catch size.

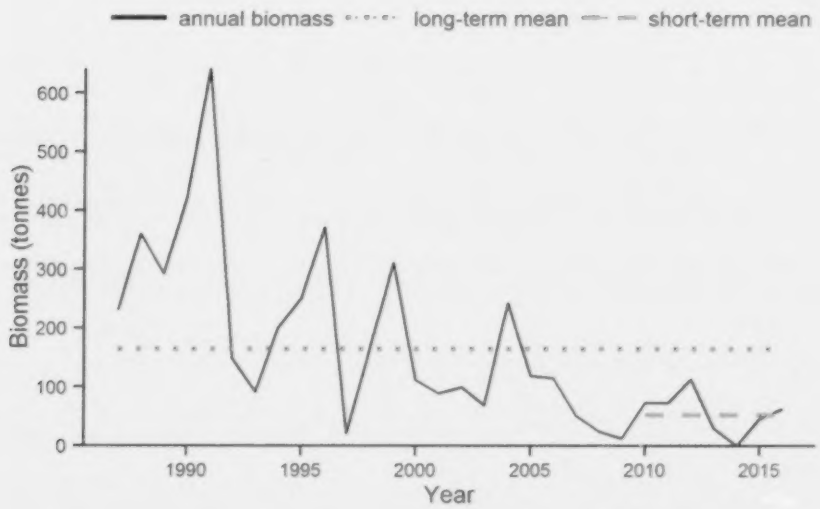

Figure 7b. Biomass index for Thorny Skate in Strata 5Z1-5Z4 from the Winter RV Survey is represented by the solid black line. The dotted red line represents the long-term survey average (1987-2015). The dashed blue line represents the short-term 5-year average (2011-2015).

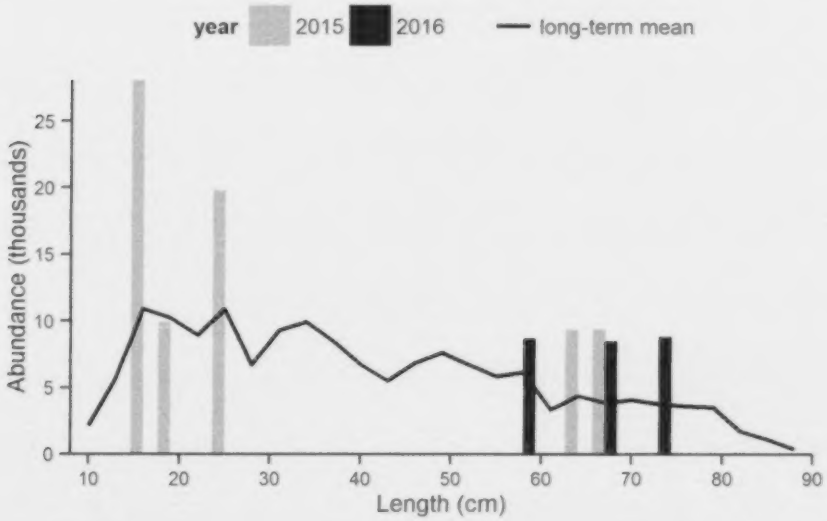

Figure 7c. Length frequency indices for Thorny Skate in Strata 5Z1-5Z4 from the Winter RV Survey. The grey bars represent the estimated number in thousands at length for 2015. The black bars represent the estimated number in thousands at length for 2016. The solid black line represents the average number in thousands at length for the time period 1987-2014.

Barndoor Skate

Barndoor Skate were captured along the edges of Georges Bank in small numbers (Figure 8a). The current biomass estimate is above both the long and short-term means (Figure 8b). Primarily small (<50cm) Barndoor Skates were captured in the 2016 survey (Figure 8c).

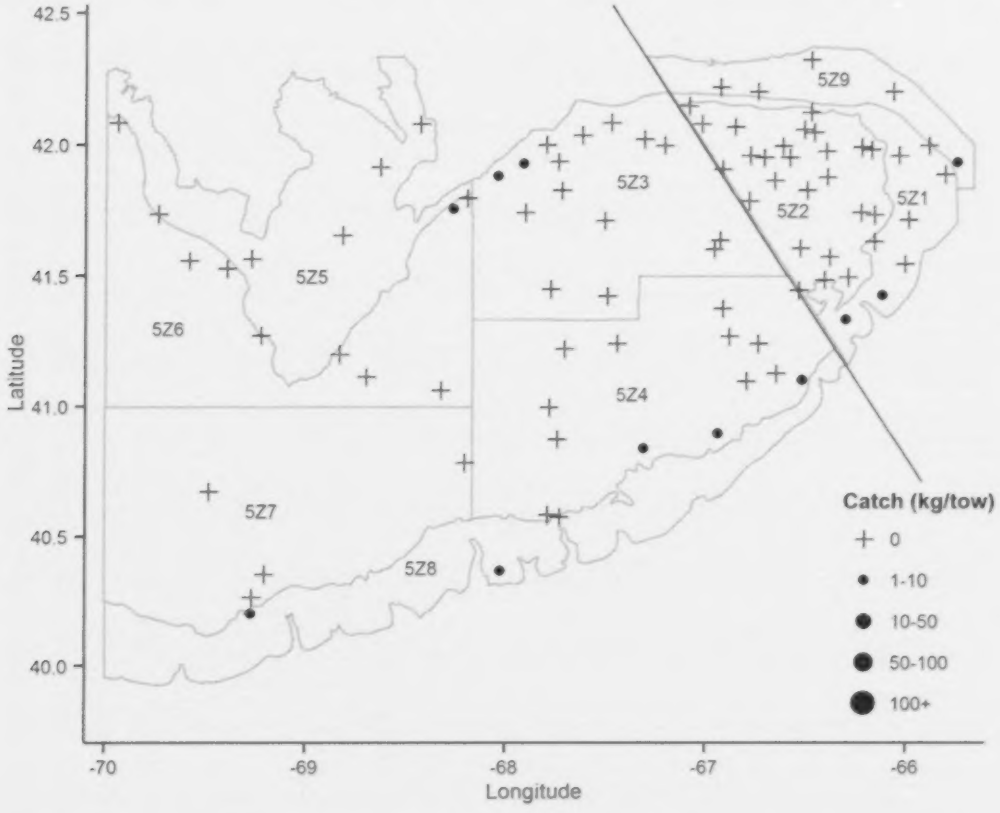

Figure 8a. Distribution of Barndoor Skate catches during the 2016 Winter RV Survey. Zero catch is represented by the + symbol. Black circles represent catches. The circle area is proportional to the catch size.

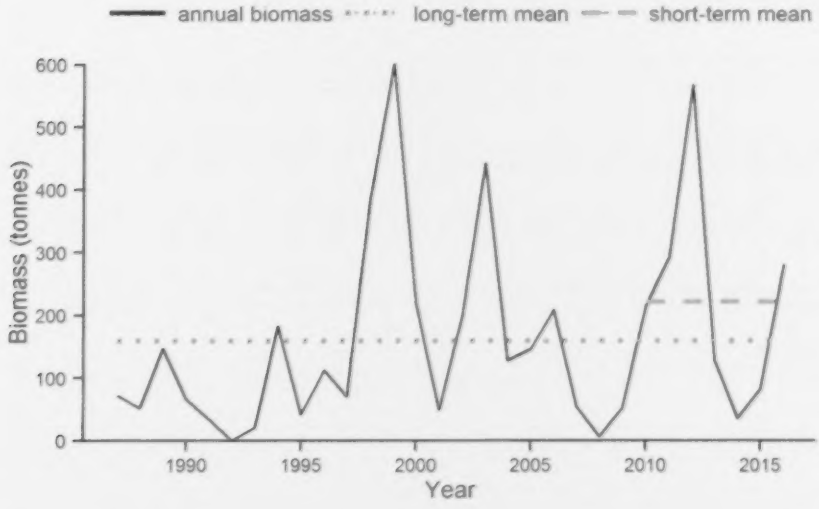

Figure 8b. Biomass index for Barndoor Skate in Strata 5Z1-5Z4 from the Winter RV Survey is represented by the solid black line. The dotted red line represents the long-term survey average (1987-2015). The dashed blue line represents the short-term 5-year average (2011-2015).

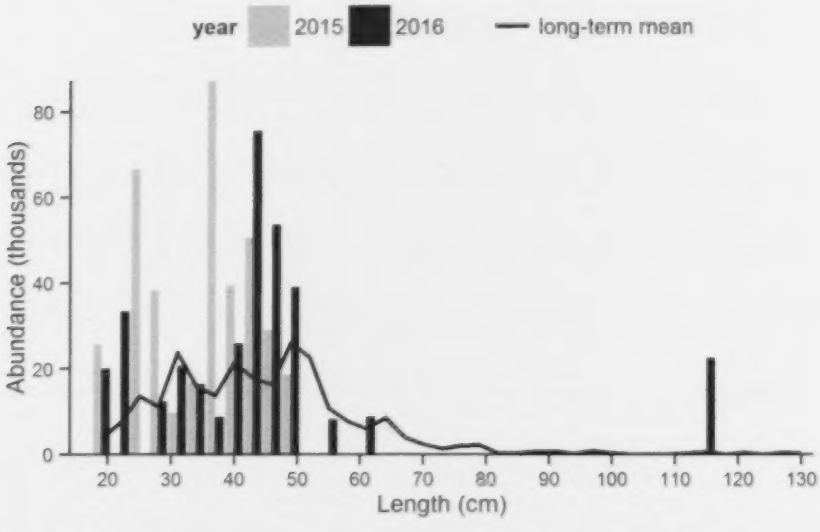

Figure 8c. Length frequency indices for Barndoor Skate in Strata 5Z1-5Z4 from the Winter RV Survey. The grey bars represent the estimated number in thousands at length for 2015. The black bars represent the estimated number in thousands at length for 2016. The solid black line represents the average number in thousands at length for the time period 1987-2014.

Winter Skate

Winter Skate were distributed across Georges Bank with a number of large catches occurring in Strata 5Z1 and 5Z4 (Figure 9a). At lengths below approximately 35–40cm, it is very difficult to distinguish Little and Winter skates. Common practice at-sea in the past was to group all small skates as Winter Skates if they lacked the features of sexual maturity used to identify Little Skate. These small skates (<40cm) are now separated from either Little or Winter skates at sea. These small skates have been included in the total weight for Winter Skate for this document.

The 2016 biomass index is above both the short and long-term means (Figure 9b). Small skates make only a minor contribution to this weight, which remains above the long-term average even if the weight of small skates is excluded. The numbers at length were above average for large Winter Skate in 2016 (Figure 9c).

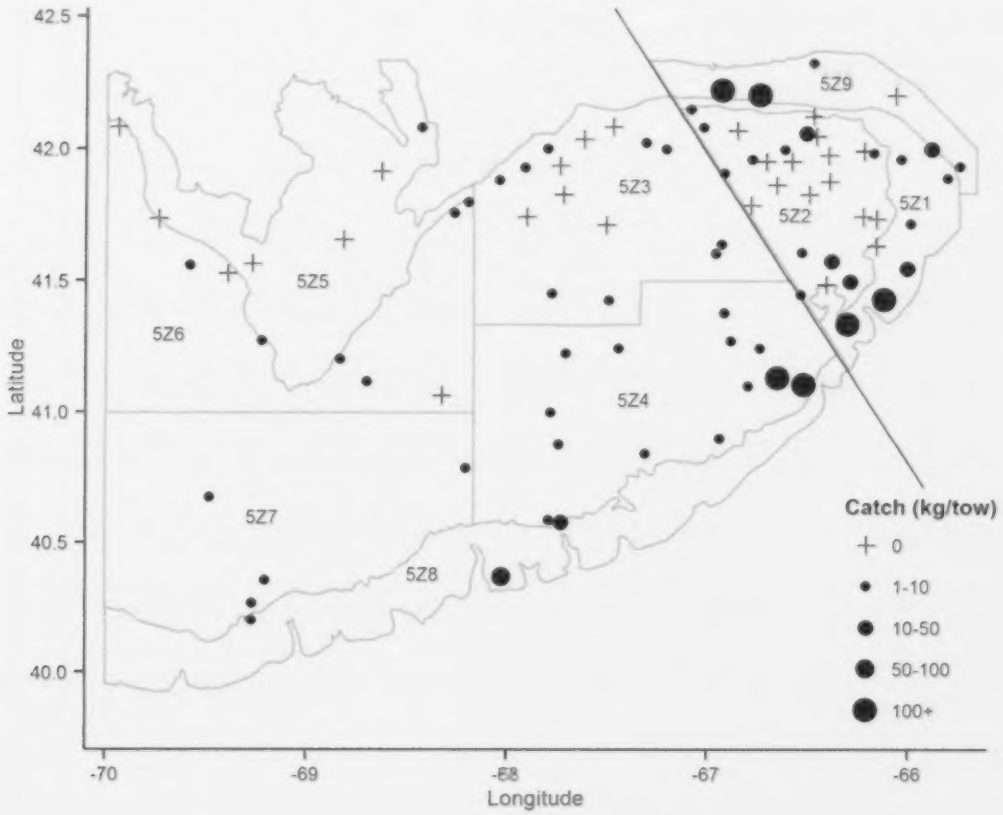

Figure 9a. Distribution of Winter Skate catches during the 2016 Winter RV Survey. Zero catch is represented by the + symbol. Black circles represent catches. The circle area is proportional to the catch size.

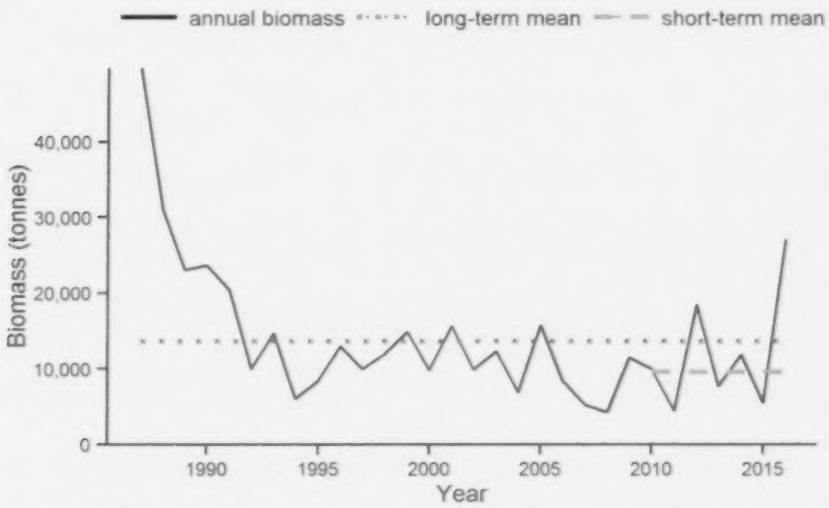

Figure 9b. Biomass index for Winter Skate in Strata 5Z1-5Z4 from the Winter RV Survey is represented by the solid black line. The dotted red line represents the long-term survey average (1987-2015). The dashed blue line represents the short-term 5-year average (2011-2015).

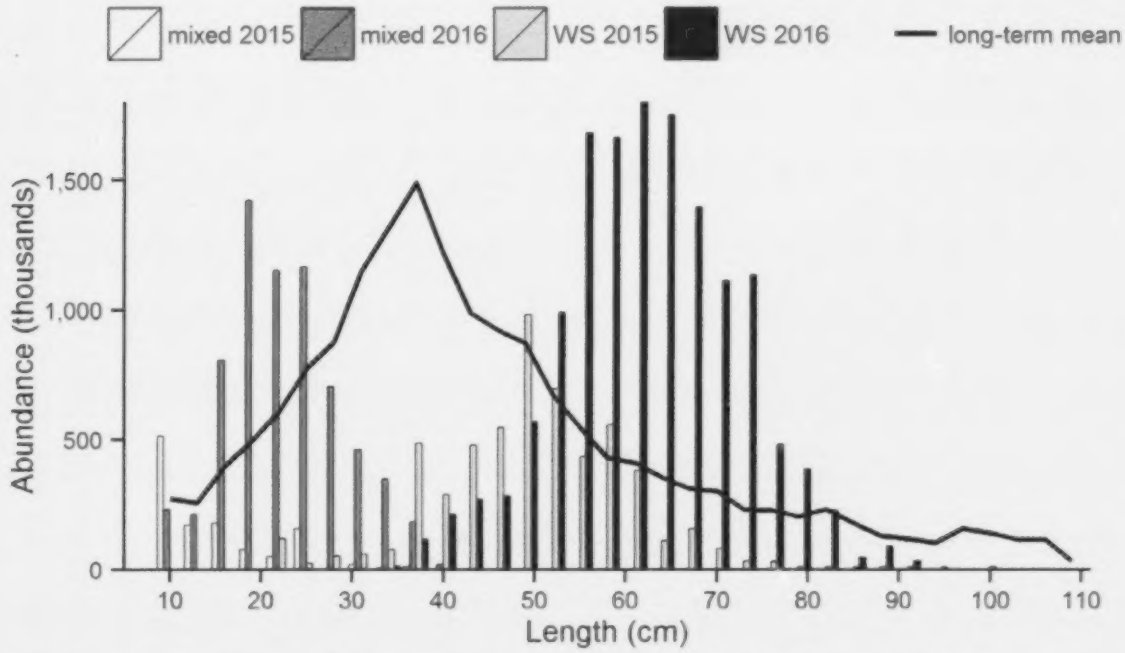

Figure 9c. Length frequency indices for Winter Skate in Strata 5Z1-5Z4 from the Winter RV Survey. The grey bars represent the estimated number in thousands at length for 2015. The black bars represent the estimated number in thousands at length for 2016. Light grey (2015) and dark grey (2016) bars represent mixed Little and Winter Skate that cannot be identified to species based on size. The solid black line represents the average number in thousands at length for the time period 1987-2014.

Little Skate

Little Skate were distributed across Georges Bank (Figure 10a). The 2016 biomass estimate is below the short and long-term averages (Figure 10b). Abundance was similar to the long-term mean, but comprised of smaller fish (Figure 10c).

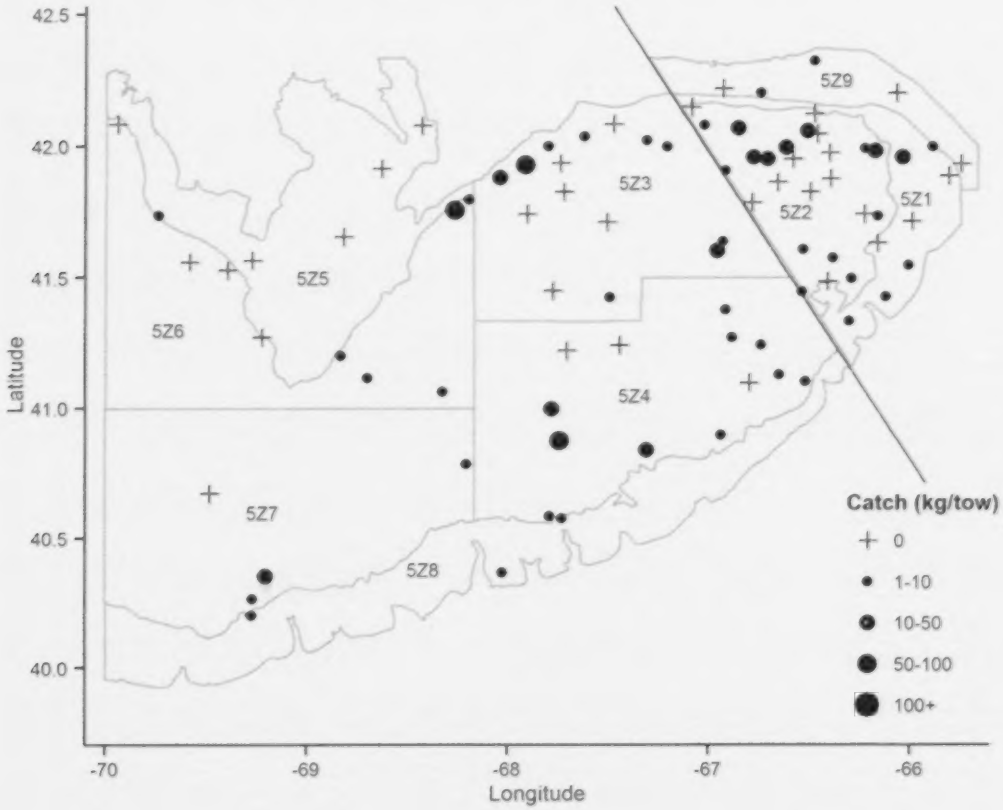

Figure 10a. Distribution of Little Skate catches during the 2016 Winter RV Survey. Zero catch is represented by the + symbol. Black circles represent catches. The circle area is proportional to the catch size.

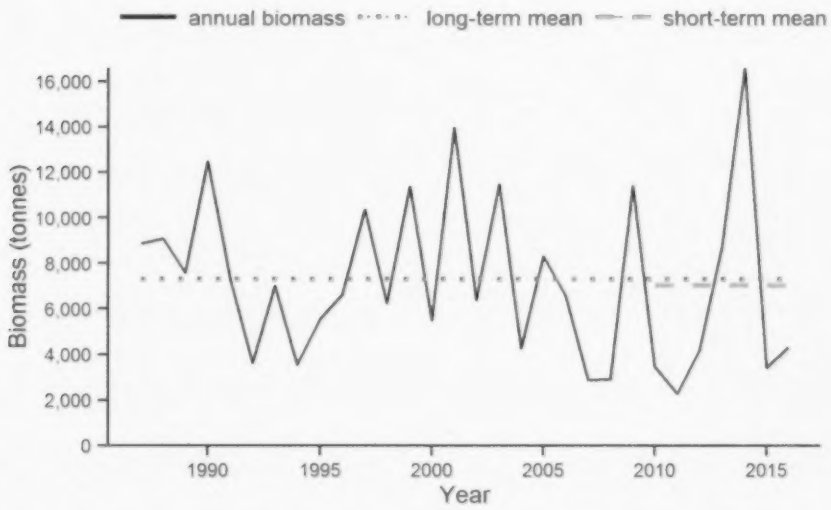

Figure 10b. Biomass index for Little Skate in Strata 5Z1-5Z4 from the Winter RV Survey is represented by the solid black line. The dotted red line represents the long-term survey average (1987-2015). The dashed blue line represents the short-term 5-year average (2011-2015).

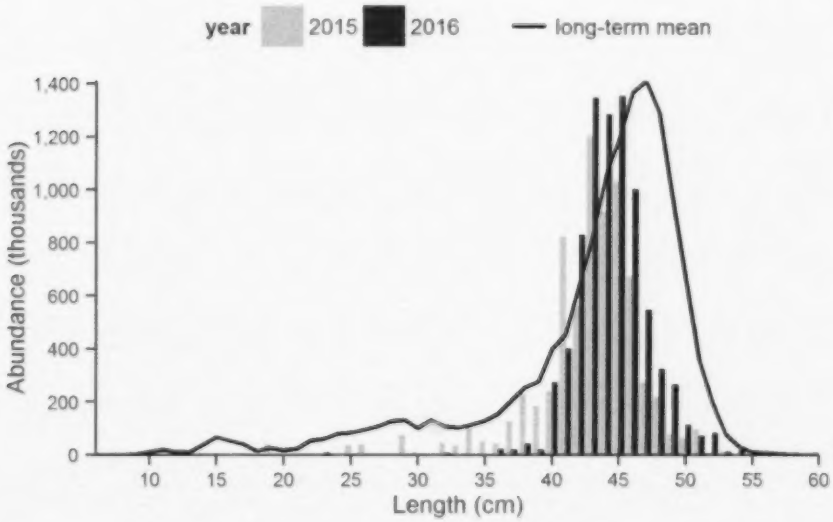

Figure 10c. Length frequency indices for Little Skate in Strata 5Z1-5Z4 from the Winter RV Survey. The grey bars represent the estimated number in thousands at length for 2015. The black bars represent the estimated number in thousands at length for 2016. The solid black line represents the average number in thousands at length for the time period 1987-2014.

Conclusions

Biomass indices from strata 5Z1-5Z4 from the 2016 Winter RV Survey on Georges Bank were below the long-term (1987-2015) average biomass for Cod, Yellowtail Flounder, Thorny Skate, and Little Skate. The Haddock biomass indices were the highest in the series in 2015 and continue to remain high in 2016. In 2016, catches of Winter Skate and Barndoor Skate were also above both their long-term and short-term averages. For species such as Smooth Skate and Pollock, which are generally found in water deeper than is found in Strata 5Z1–5Z4 on Georges Bank, this index may not provide useful information for monitoring abundance trends; surveys in adjacent deeper waters may be more suitable.

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